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14. ABSTRACT

The Joint AirSpace Management and Deconfliction (JASMAD) program is an AFRL/IFSA Advanced Technology Demonstration (ATD) program that will design , develop, test, and field a single Joint Service airspace management and deconfliction network centric information capability, to be included in the Air and Space Operations Center Weapon System (AOC WS). JASMAD will be an operational-to-tactical level airspace management system enabling the Airspace Control Authority (ACA) to effectively manage the creation and optimization of airspaces through distributed (shared context) collaborative planning and dynamically manage and monitor airspaces during force employment among the warfighting Components/Services/Agencies and Coalition Partners and civil aviation authorities.

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JOINT AIRSPACE MANAGEMENT AND DECONFLICTION (JASMAD) -

JASMAD: Meeting Current and Future Combat Airspace Requirements

Authors: Michael Seifert, Tony Dilego, John Hitchings, Joshua Sterling,
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INTRODUCTION

The Joint AirSpace Management And Deconfliction (JASMAD) program is an AFRL/IFSA Advanced Technology Demonstration (ATD) program that will design, develop, test, and field a single Joint Service airspace management and deconfliction network centric information capability, to be included in the Air and Space Operations Center Weapon System (AOC WS).

JASMAD will be an operational-to-tactical level airspace management system enabling the Airspace Control Authority (ACA) to effectively manage the creation and optimization of airspaces through distributed (shared context) collaborative planning and dynamically manage and monitor airspaces during force employment among the warfighting Components/Services/Agencies and Coalition Partners and civil aviation authorities.

MILITARY CHALLENGE

Lessons learned from every encounter with hostilities during the past 15 years have shown that airspace management, including the coordination, integration and regulation of the use of airspace of defined dimensions, must be improved. Airspace control is becoming more complex and difficult. Complications with congested airspace foreshadow problems using future long range, high-endurance or loitering sensors and munitions. The current C2 decision aids, situation awareness, and ability to respond in a timely manner to rapidly changing environments are lacking in required capability. Fratricide and near-misses are all too common and recent experiences such as Operation Allied Force and Operation Iraqi Freedom have demonstrated that because of the ever increasing application of technology to airframes (stealth, unmanned vehicles, etc.) there is a need to manage not only friendly airspace, but the airspace over hostile territory as well. OIF employed a varied mix of assets with unique characteristics. Additionally, more sorties are flown at night than in daylight, thus, "See and Avoid" policies are very difficult to apply. What is needed is a joint dynamic planning and execution airspace control system which ensures systems and concepts are developed & evaluated in a joint context.

CURRENT AIRSPACE MANAGEMENT

Currently, Airspace Management functions are performed by the Airspace Deconfliction System (ADS) in Theater Battle Management Core Systems (TBMCS). ADS allows operators to plan the airspace laydown, receive requests for additions or changes to the airspace laydown, and notify users of airspace conflicts. These airspaces are represented as Airspace Coordinating Measures (ACMs) and are stored in the Air Operations Data Base (AODB). From this information in the AODB, operators can create the Airspace Coordination Order (ACO) which is disseminated to the services, components, agencies, and other partners.

Future requirements for Airspace Management include dynamic airspace control and deconfliction during execution, while ADS primarily functions as a static planning tool.

JASMAD REQUIREMENS COLLECTION

The JASMAD system will support the Airspace Management Planning Team (AMPT), the Combat Plans Division (CPD) and Combat Operations Divisions (COD). The JASMAD system will function to develop and disseminate the Airspace Control Plan (ACP), and the ACO. The tasking derived from the ACP will be disseminated via the ATO and the ACO. The CPD AMPT is responsible for developing the ACO supporting the development of the ATO, whereas the COD Airspace Management Team supports the execution the ACO/ATO and deconflicts immediate airspace requests.

The JASMAD team made numerous site visits to interview airspace planners and discuss what they viewed as limitations with ADS, airspace management and deconfliction process in general and what capabilities they would like to see in the future. The team also reviewed the current doctrine on airspace planning, Joint Service Publications, Air Force Operating Tactics, Techniques, and Procedures (AFOTTP)'s documents and the future requirements of the AOC WS Block 10.2 as defined by the AOC Requirements Working Group (RWG). In addition, lessons learned from Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and the UK Operation TELIC will also be applied to the development of the JASMAD functional requirements. All these requirements and the current capabilities available in ADS formed the basis of the JASMAD Functional Requirements Document (FRD). The JASMAD requirements collection process is shown below in figure 1.

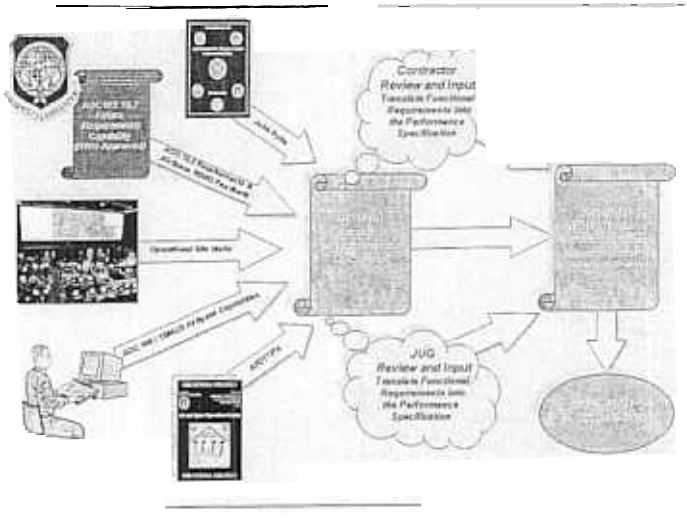

Figure 1: JASMAD Functional Requirements Collection Process

This process describes how the JASMAD functional requirements were collected to provide a comprehensive airspace planning, management and deconfliction network centric information

capability. A summary of the high level capability statements are broken down into planning and execution capabilities.

Planning:

4-D visual airspace management (latitude/longitude, height, time)
Selectable airspace sorting criteria (i.e. mission packages, time, target areas)
Exportable report and presentation generation of tailored information products
Importing routes and operating areas to facilitate creating ACM's
Assured connectivity to exchange deconflicted packages with appropriate nodes
Tailorable faster than real time fly out of ATO
Collaborative planning concurrently showing visual airspace deconfliction
Operations within civil airspace

Execution:

4-D airspace observation of ATO/ACO execution
Dissemination or depiction of ACM's in near-real time (all pertinent nodes)
Provide replanning and retasking options (real time monitoring)

- Dynamic route change inclusion into airspace picture
- Near-real time secure method of supporting user's info updates
- Collaborative execution of airspace plan (real time feedback to planning cycle)
- Automatic alert notifications of abnormal operations (conflicts)

JASMAD OBJECTIVES

The goal of airspace management is to enhance air, land, maritime, and Special Operations Force (SOF) effectiveness in accomplishing the JFC's objectives, while decreasing the potential for fratricide. The objectives JASMAD are to develop a single distributed joint theater airspace management and dynamic deconfliction capability to coordinate real time ATO planning and execution among the Service Components and Coalition partners to minimize conflicts and optimize the airspace. It seeks to enhance automation and visualization to collaboratively create and process the ACMs, to create, import, modify and disseminate the ACP and ACO across all phases of a campaign. It will provide near real-time deconfliction for all Service Components during mission execution JASMAD will be developed as an AOC WS system net centric information capability in keeping with Joint Vision 2020's Net Centric Warfare vision. JASMAD will provide users with better capabilities to collaborate with other airspace users, monitor airspace execution, and dynamically plan and replan as the situation dictates. In addition, JASMAD will have enhanced 4D visualization capabilities including the ability to visualize and detect weather conflicts and display tactical data feeds. JASMAD will also include automation tools to streamline the airspace planning process well beyond the abilities of currently available systems.

One feature of JASMAD will be the ability to import the Air Defense Plan (ADP) defense designs so the airspace requirements of the Integrated Air Defense Systems (IADS) can be considered in the airspace planning process, thus potentially reducing the amount of deconfliction necessary and possible fratricide. The integration of the ADP and ACP allow the Joint Force Air Component Commander (JFACC) to establish broad airspace control

guidance when implementing Area Air Defense Commander (AADC) and Airspace Control Authority (ACA) responsibilities. When creating an interoperable ADP and ACP, it is imperative to have a clear understanding of the basic operation plan, host-nation and multinational political constraints; capabilities of the Air Traffic Control (ATC) system; and the location, capabilities, and intent of friendly and hostile forces.

SPIRAL DEVELOPMENT

The JASMAD ATD will follow a spiral development process with Northrop Grumman-PRB Systems as the prime software developer and the AFRL JASMAD in-house software development team providing concept definition, software prototyping and software testing to support the development of the JASMAD system. The ACO WS block 10.2 Future Capabilities, as related to JASMAD, have been captured and have been organized in six Spirals as an initial cut at a logical development process. As many of these capabilities will be developed as fiscal and time constraints permit.

Spiral 1-Demonstrate a collaborative planning environment.
Facilitate shared context collaboration.
Prototype a Graphical User Interface.
Prototype a 1D-4D visualization capability (lat/long, height, time, etc.).

Spiral 2-Demonstrate capability to evaluate airspace visualization products.
Demonstrate prototypical capability to identify airspace conflicts.
Create and import routes and operational areas/volumes to facilitate ACMREQS and operations within civil airspace.
Demonstrate and evaluate JASMAD interaction with civil airspaces.
Demonstrate that data is available to populate a Link 16 message.

Spiral 3-Produce deconflicted packages to exchange with appropriate nodes.
Prepare ACM's for dissemination or depiction in near-real time.
Demonstrate and evaluate collaborative planning and airspace deconfliction.

Spiral 4-Demonstrate to evaluate the export and presentation of reports and tailored.
Information products via Link 16 or other data links, Machine to Machine (m2m), text, GOTS and standard COTS office products as applicable.
Demonstrate sorting of airspace information, i.e., mission packages, temporal, or area query satisfaction.
Demonstrate automatic alert notification of pending abnormal conditions, i.e., conflicts.

Spiral 5-Accept collaborative execution of airspace plan (real time feedback to planning cycle).
Prepare updates for near-real time secure method of supporting user's information updates.
Provide replanning and retasking options (real time monitoring).
Dynamic route change inclusion into airspace picture.

Spiral 6-Advanced Technology Demonstration:

4-D airspace observation of ATO/ACO execution.

Tailorable faster than real time fly out of ATO/ACO.

Baseline System-

Requires Integration and Sustainment funds.

ATD with any "fixes" needed.

Ready for integration testing, transition and fielding.

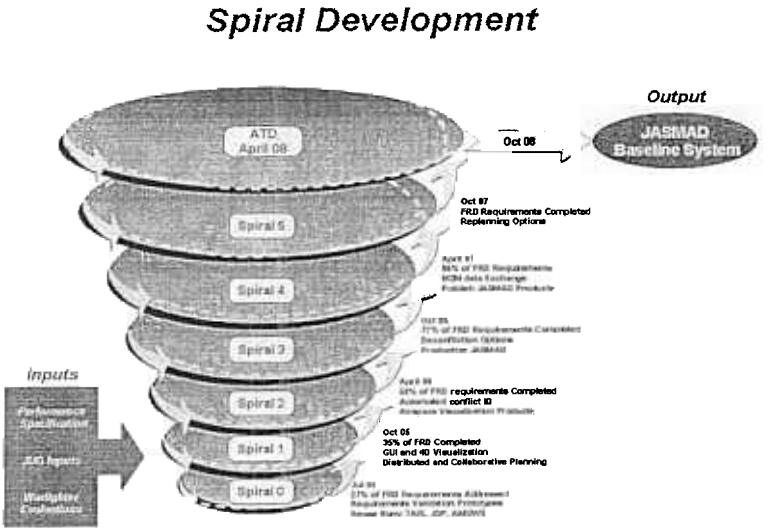

Figure 2: Spiral Develop Schedule

The planning capabilities of JASMAD include providing a 4-D visual picture for the purposes of airspace management (latitude, longitude, altitude and time information). The airspace planner will be able to select and sort variables within the airspace based on criteria such as mission packages, launch times, time on target, target areas, altitude blocks and air refueling tracks. AOC airspace managers and functional planners will be able to import routes and operating areas to facilitate creating the ACMs. Military operations in the battlespace normally encompass transiting civil airspace to enter or depart the objective area. JASMAD must also be interoperable with the Federal Aviation Agency (FAA) and the International Civil Aviation Organization (ICAO); a capability not available to today's operational or tactical level theater planners. JASMAD will have the capability to import/export routes within civil airspace. The end-planning product should be the ability to produce completely deconflicted packages. JASMAD will also allow "faster than real-time" fly out of ATO. This along with collaborative planning will be able to concurrently show visual airspace deconfliction. During execution, JASMAD will allow 4-D airspace observation of ATO/ACO execution. It will prepare the ACM's for dissemination and allow depiction of ACM's in near-real time (all pertinent nodes) providing the capability to offer re-planning and re-tasking options during near real-time execution of the ATO. Operators will be able to change routes and preview the impact on airspace management through the fly out feature. Conflict alerts will automatically identify negative aspects of those proposed route changes. As conflicts develop, or are about to develop, JASMAD will automatically provide alerting

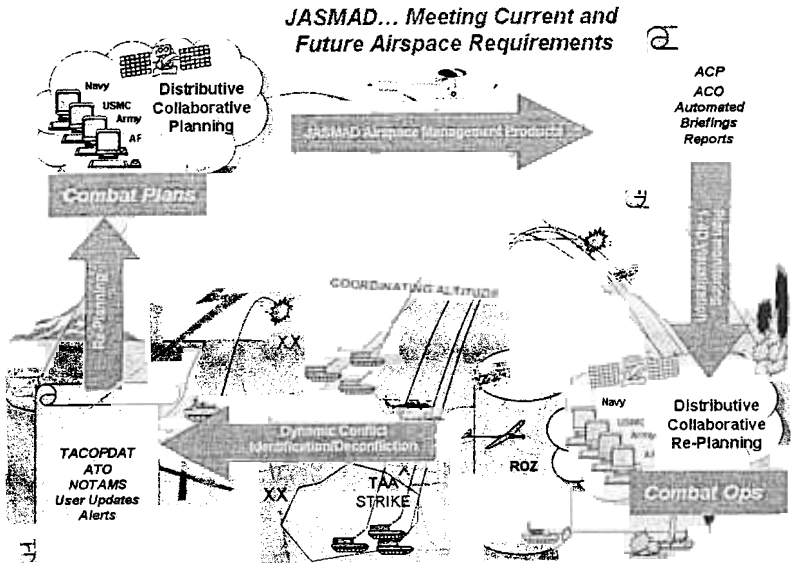

Figure 3: JASMAD Concept

services, allowing the operator the opportunity to resolve the potential conflicts. This requires coordination with aircraft mission planners, e.g. Joint Mission Planning System (JMPS), to get detailed flight plan information to support execution operations. To accomplish near real-time execution JASMAD will need to develop interfaces to systems such as the JMPS, Global Air Traffic Management (GATM) system, and the tactical digital information link (TADIL) J system. This will facilitate lower level tactical planners to have visibility with other users as they plan their airspace usage and needs.[1]

SUMMARY

The JASMAD ATD program was born both joint service and combined arms, as well as with our UK ally under the US/UK Air Battle Management (ABM) Memorandum Of Understanding (MOU). The ABM MOU Steering Group (SG) is co-chaired by the UK Ministry Of Defence (MOD) and the Air and Space Operations Center (AOC) Weapon System (WS) System Program Office (SPO).

AFRL has a long history of developing Command and Control applications and decision aids for the joint services. Many of these applications are now integral parts of the TBMCS fielded System Of Record (SOR). Among them are: the Theater Air Planner (TAP) which was developed as the Advanced Planning System (APS); the Joint Defensive Planner (JDP); Execution Management (EM) Reports (EM Reports). Another of our products, the Master Caution Panel (MCP), although not joint, is currently being tested for fielding in TBMCS 1.1.3.

JASMAD is targeted to be fielded in the AOC WS Block 10.2 in FY 09, to provide the warfighter with a collaborative and distributed, net centric information capability, that satisfies the future airspace management and deconfliction capabilities as stated in the AOC WS CDD.

1. Alex M. Wathen, 2004, "The Future of Airspace Management Depends on JASMAD"